

# Cardiac pseudoaneurysm as a complication of native mitral valve infective endocarditis

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<b>Background</b>	The delayed development of a mitral valve annulus pseudoaneurysm is a rare and late complication of a native mitral abscess cavity.
<b>Case summary</b>	Currently, there are no documented cases of a pseudoaneurysm developing from an abscess cavity of the posterior annulus of the native mitral valve. We report a case of a patient who presented with worsening progressive shortness of breath that was found to be secondary to a pseudoaneurysm. This was detected by 2D echocardiogram and cardiac computed tomography angiography.
<b>Discussion</b>	In our case, the patient developed a late complication of a ventricular pseudoaneurysm originating from the mitral annular area of the abscess cavity. Per the surgical literature, one method to avoid the aforementioned complication is via cavity repair with a bovine patch.
<b>Keywords</b>	Mitral abscess • Pseudoaneurysm • Case report • Infective endocarditis
<b>ESC Curriculum</b>	6.1 Symptoms and signs of heart failure • 4.11 Endocarditis • 2.2 Echocardiography

## Learning points

- A pseudoaneurysm can be a late complication of a native mitral valve abscess.
- The abscess cavity can be repaired with a bovine patch to prevent cardiac pseudoaneurysm development.

## Introduction

The delayed development of a mitral valve annulus pseudoaneurysm is a rare and late complication of a native mitral abscess cavity. However, pseudoaneurysm development from prosthetic infective endocarditis (IE) and mitral valve replacement (MVR) have been

reported in the literature.<sup>1,2</sup> An important clinical feature of pseudoaneurysms is their propensity for further rupture with fatal outcomes. Here, we describe a mitral valve annulus pseudoaneurysm that was diagnosed 12 months after initial visualization of the mitral valve abscess cavity on the native mitral valve with echocardiogram and was thought to be secondary to IE.

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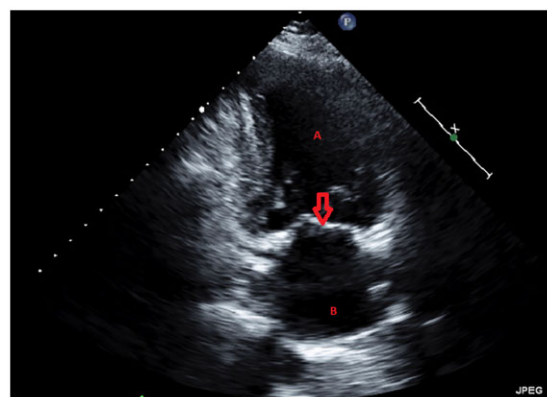
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## Timeline

One-year prior	The patient had bacterial endocarditis and underwent mitral valve replacement (MVR) with a 29 mm Edwards pericardial tissue valve with Maze procedure. During MVR, abscess-like cavity was noticed behind P3 segment extending to the wall of the ventricle. The abscess was debrided and extensively irrigated.
Day of presentation to the clinic	Presented with fatigue and dyspnoea on exertion to the cardiology clinic.
Day 1	A follow-up echocardiogram completed on the next day which showed a pseudoaneurysm extending from the basilar inferior-lateral wall nearly at the mitral annulus.
Day 8	A cardiac computed tomography angiography was obtained due to the abnormal transthoracic echocardiogram findings that revealed a large pseudoaneurysm inferior to the mitral annulus plane.
Day 9	Corrective surgery was offered but the patient declined.

## Case presentation

A 79-year-old female came to the Cardiology clinic for evaluation of fatigue and dyspnoea on exertion. Her past medical history was significant for non-ST-elevation myocardial infarction, paroxysmal atrial fibrillation, endocarditis, hypertension, and hyperlipidaemia. Vital signs were within normal limits, and a physical exam revealed a Grade 2/6 systolic ejection murmur at the apex with 1+ pitting oedema on the lower extremities bilaterally. The remainder of the physical exam was unremarkable. Patient was on lisinopril 20 mg daily and metoprolol 12.5 mg twice daily, aspirin 81 mg, and atorvastatin 80 mg daily. Haemoglobin was 11.5 mg/dL but the rest of the complete blood count and comprehensive metabolic panel was unremarkable. The patient had bacterial endocarditis a year prior and underwent MVR with a 29 mm Edwards pericardial tissue valve with Maze procedure. During left atriotomy, large polyp-like fibrinous debris was found on the P2 segment of the posterior leaflet at the site of endocarditis. The posterior leaflet was sharply excised along with its chordal attachments. The annular region behind the P2 segment was degenerative. It was heavily calcified and was debrided with rongeurs. Behind the P3 segment, there was an abscess-like cavity extending to the wall of the ventricle. The abscess was debrided, and the annulus was extensively irrigated and debrided of any loose tissue. The anterior leaflet was detached from the annulus, and portions of it were spared to retain the chordal attachments. The valve was

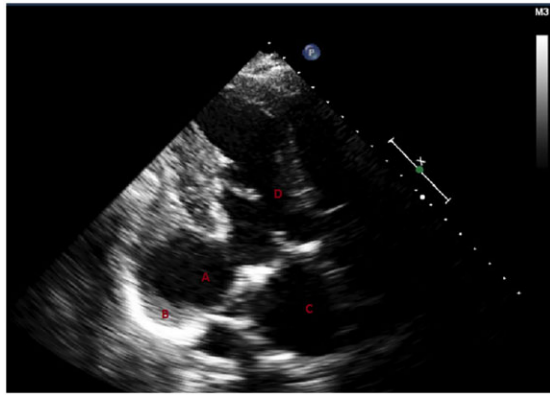


**Figure 1** Native mitral valve with mild annular and leaflet calcification. (A) Left ventricle and (B) atrium. Arrow shows the mitral valve.

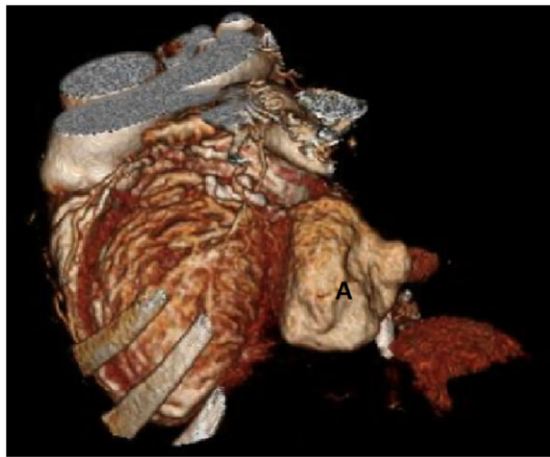
sized for a 29 mm Edwards pericardial tissue valve. Her post-operative course was complicated by symptomatic bradycardia, and she underwent pacemaker implantation. The patient was subsequently discharged and was to undergo cardiac rehabilitation. The previous 2D echocardiogram revealed an average left ventricular ejection fraction (LVEF) of 63% and mild calcification on the native mitral valve (Figure 1). A follow-up echocardiogram completed on the day after the presentation of symptoms showed a pseudoaneurysm extending from the basilar inferior-lateral wall nearly at the mitral annulus. There was a heterogeneous echo-density (thrombus) within this area, though it was laminated to the distal wall (Figure 2). The LVEF was 45–49%, with mild left ventricular hypertrophy and akinesia of the mid-to-apical anterolateral wall. The remaining left ventricular segments were hypokinetic. The mitral valve prosthesis demonstrated a normal leaflet motion with an average transvalvular gradient for valve type and size. A cardiac computed tomography angiography (CTA) was obtained due to the abnormal transthoracic echocardiogram (TTE) findings that revealed a large pseudoaneurysm inferior to the mitral annulus plane (Figures 3 and 4). The pseudoaneurysm extended inferiorly and posteriorly, measuring approximately 59.1 mm × 63.6 mm. The neck of the pseudoaneurysm measured approximately 24 mm and was mildly calcified. A layered thrombus was noted in the posterolateral aspect of the aneurysmal sac (Figure 5). The cavity was pulsatile with systole, and the sac protruded posteriorly. Corrective surgery was offered but the patient declined. Her shortness of breath improved with an increased dose of furosemide. She remained asymptomatic on furosemide, aspirin, atorvastatin, and carvedilol at the time of her 2-year follow-up with cardiology. No surgical intervention was performed for the pseudoaneurysm.

## Discussion

Pseudoaneurysms are rare complications of MVR and prosthetic mitral valve IE. Studies have reported that pseudoaneurysms are most commonly caused by myocardial infarction followed by IE resulting in



**Figure 2** Pseudoaneurysm arising from the basal posterolateral wall. (A) Pseudoaneurysm, (B) thrombus, (C) left atrium, and (D) left ventricle.



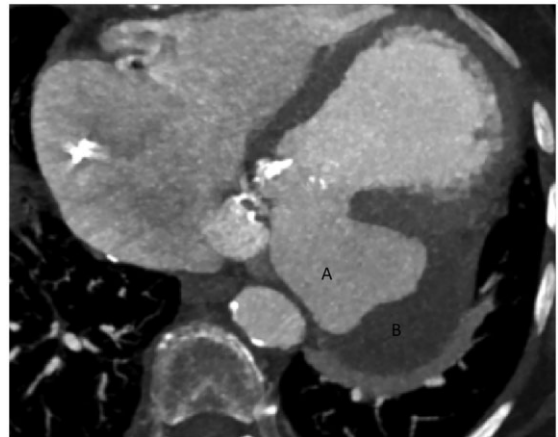
**Figure 3** Three-dimensional volume demonstrating the pseudoaneurysm with posterior extension. (A) Pseudoaneurysm.

an abscess cavity.<sup>3</sup> The incidence of LV pseudoaneurysms occurs in 0.8% of cases after MVR, and the incidence is 8-times higher than that of pseudoaneurysm development after myocardial infarction.<sup>3</sup> Pseudoaneurysms are most often found in the posterior location compared to a true aneurysm that usually forms in the anterior or apical wall. In our case, the abscess cavity in the P3 segment of the native mitral valve developed into a pseudoaneurysm due to IE.

The extension of infection into the periannular area in IE is more commonly associated with prosthetic valve endocarditis (55–94%) than native valve endocarditis (19–40%). The most worrisome complication of periannular extension of IE is periannular ring abscesses or pseudoaneurysms. The frequency of



**Figure 4** Sagittal cardiac computed tomography angiography with demonstration of the pseudoaneurysm cavity with a wide neck. (A) Pseudoaneurysm.



**Figure 5** Axial cardiac computed tomography angiography demonstrating the left ventricular pseudoaneurysm inferior to the mitral annular plane with layered thrombus. (A) Pseudoaneurysm and (B) thrombus.

developing a pseudoaneurysm periannular ring abscess is unclear, however, studies have shown that IE-associated periannular extension is most commonly associated with aortic valve infection.<sup>4,5</sup> Shimotakahara *et al.*<sup>2</sup> reported a case of a pseudoaneurysm originating from the posterior annulus of the prosthetic mitral valve that was a complication of IE in the prosthetic mitral valve itself. In our patient, the pseudoaneurysm developed from the periannular area of the native mitral valve. There are two hypotheses of pseudoaneurysm development from the periannular ring abscess. First, bacterial invasion of the mitral valve's

annulus region (annulus) causes destruction, necrosis, and development of an abscess cavity. This can extend into the ventricle and develop into a pseudoaneurysm. The second hypothesis suggests that bacterial invasion of the annular region can lead to weakening of the ventricular wall. This can predispose to dissection of a small portion of the ventricular wall with the eventual development of a pseudoaneurysm as was found in our patient.

Cardiac pseudoaneurysms are challenging to diagnose. In our patient, the abscess cavity extended to the ventricular wall that may have caused the pseudoaneurysm to develop. This is a rare finding as the pseudoaneurysm leads to heart failure symptoms. The abscess cavity can be repaired with a bovine patch to prevent cardiac pseudoaneurysm development. Studies have shown that debridement of an extensive abscess in the mitral ring can be closed with a dacron or pericardial patch and filled with formulated resorcin glue.<sup>6</sup> Previous studies have recommended that with a mitral valve abscess, debridement, and reconstruction of the atrioventricular groove with a patch before MVR or repair can be done, but it is not a Class 1 indication.<sup>7</sup> Extensive annular debridement, and reconstruction of a mitral paravalvular abscess may lead to severe complications, such as acute inferolateral myocardial infarction, left atrioventricular rupture, and a compromised circumflex coronary artery.<sup>7</sup> In our patient, reconstruction of the cavity abscess with a patch was not performed due to the high risk of these complications. The management of pseudoaneurysms is surgical repair, and in patients with high surgical risk, percutaneous exclusion can be done to reduce the risk of rupture or just conservative management alone. Our patient declined surgical intervention as she had a higher surgical risk and was therefore managed conservatively.

## Conclusion

We present a case of IE of the native mitral valve in a patient subsequently underwent an MVR with a bioprosthetic valve. She developed a late complication of a pseudoaneurysm originating from the mitral annular area of the abscess cavity. Based on previous surgical literature, the abscess cavity can be repaired with a bovine patch to prevent cardiac pseudoaneurysm development. A 2D echocardiogram is suggested to all patients with IE who have shortness of breath regardless of follow-up TTE. Cardiac magnetic resonance imaging/CTA has a high clinical utility in the diagnosis of a suspected pseudoaneurysm.

## Lead author biography



Muhammad Zubair Khan is internal medicine resident, applying for cardiology fellowship. His research of interest is heart failure.

## Supplementary material

**Supplementary material** is available at *European Heart Journal—Case Reports* online.

**Slide sets:** A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

**Consent:** The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidance.

**Conflict of interest:** None declared.

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## References

1. Antonic M, Djordjevic A, Mohorko T, Petrovic R, Lipovec R, Juric P. Left ventricular pseudoaneurysm following atrioventricular groove rupture after mitral valve replacement. *SAGE Open Med Case Rep* 2019;**7**:1–4. <https://doi.org/10.1177/2050313X18823456>.
2. Shimotakahara J, Hirata K, Nakazato J, Yagi N, Takahashi T, Wake M et al. Left ventricular pseudoaneurysm as a complication of prosthetic mitral valve infective endocarditis. *J Cardiol Cases* 2013;**8**:e27–e30.
3. Frances C, Romero A, Grady D. Left ventricular pseudoaneurysm. *J Am Coll Cardiol* 1998;**32**:557–561.
4. Habib G, Thuny F, Avierinos JF. Prosthetic valve endocarditis: current approach and therapeutic options. *Prog Cardiovasc Dis* 2008;**50**:274–281.
5. Hulten EA, Blankstein R. Pseudoaneurysms of the heart. *Circulation* 2012;**125**:1920–1925.
6. Evans CF, Gammie JS. Surgical management of mitral valve infective endocarditis. *Semin Thorac Cardiovasc Surg* 2011;**23**:232–240.
7. Une D, Lapierre H, Beauchesne L, Ruel M. Posterior mitral abscess with bypass grafting before annulus reconstruction: a case report. *Can J Cardiol* 2013;**29**:1742.e9–11–1742.11.